Relationship of Stump Diameter to D.b.h.

For White Pine in the Northeast

A need to estimate the volume cut from a timber tract when only the stumps are left is often felt by foresters, timber operators, and landowners. This need arises in areas where timber sales are based on stump diameters, in timber trespass cases, in check cruises on marked timber sales (to determine volume cut from unmarked trees), and as an aid in piecing together the history of cutover lands as a step in forest-management work.

Since volume tables are usually based on diameter at breast height, a way was needed to relate these d.b.h. volume tables to stump measurements. Several studies have been made in the Northeast of the relationships between stump diameters and d.b.h. (4, 5, 3, 1). But in general, the results of these studies have been useful only for particular purposes, and their use has been limited to the particular areas where the studies were made.

Information of this kind would be most valuable if it could be applied anywhere in the Northeast, and for a variety of purposes; so a study was made of stump diameter-d.b.h. relationships for white pine. Similar studies are planned for other commercially important species.

Most of the basic data used in this study were taken from woods-utilization studies on private logging operations selected at random in ten states. Additional data were taken from other miscellaneous sources to strengthen those available from the woods-utilization studies.

A total of 823 stump-diameter measurements, ranging from 4 inches to 39 inches, were used. Both stump diameters and d.b.h. were measured to the nearest 1/10 inch with a diameter tape. Bark thickness was measured with a Swedish bark gage. Stump heights were measured on the uphill side to the nearest 1/10 inch.

It was found that 58 percent of the stumps left were less than 0.6 foot high; 34 percent were between 0.6 and 1.2 feet, and only 8 percent were higher than 1.2 feet.

In the computations, inside-bark stump diameters were used to avoid inaccuracies due to unequal bark thicknesses, logging damage to bark, and bark peeling off. Stump diameters were sorted into 2-inch classes. Stump-height measurements were sorted into 0.6-foot classes within each stump-diameter class.

To develop an equation expressing the stump diameter-d.b.h. relationship for white pine, the method described by Deming (3) was used. The following equation was obtained:

(D.b.h. = 0.854 (stump diameter inside bark) + 0.910 (stump height) - 0.233

The relationships developed from this equation were worked out as a graph (fig. 1). An alinement chart was also developed, but a series of comparisons between actual and computed d.b.h. showed that this was less reliable than the graph.

By using the graph, the 2-inch d.b.h. class of a white pine stump can be found quickly by plotting the intersection of the vertical ordinate (stump height) with the horizontal ordinate (stump diameter). For example, for a stump 14.3 inches in diameter and 0.4 foot high, the two lines intersect about halfway between the two limits of the 12-inch d.b.h. class.

Comparison of actual d.b.h. and those calculated with the equation showed an average weighted difference of only 0.1 inch. Comparison of actual d.b.h. with those determined on the graph (with no interpolations for fractions of inch) for stumps of less than 20 inches diameter showed an occasional difference of as much as 1 inch. However, these differences were compensating. The differences for stumps of more than 20 inches ranged up to 2 inches, but they also were compensating. These differences result from the irregular shape of the stump top--due often to an abnormal butt swelling or flaring roots.

Other studies (4 and 2) showed that the effect of site on the form of the lower bole is not significant. Geographic location also seems to have little effect. This observation is supported by the results of a special study made in connection with the forest survey. An analysis of

STUMP DIAMETER—D.B.H. RELATIONSHIP
FOR EASTERN WHITE PINE IN THE NORTHEAST

STUMP DIAMETER (INSIDE BARK), IN INCHES

D.B.H. CLASS, IN INCHES

STUMP HEIGHT, IN FEET
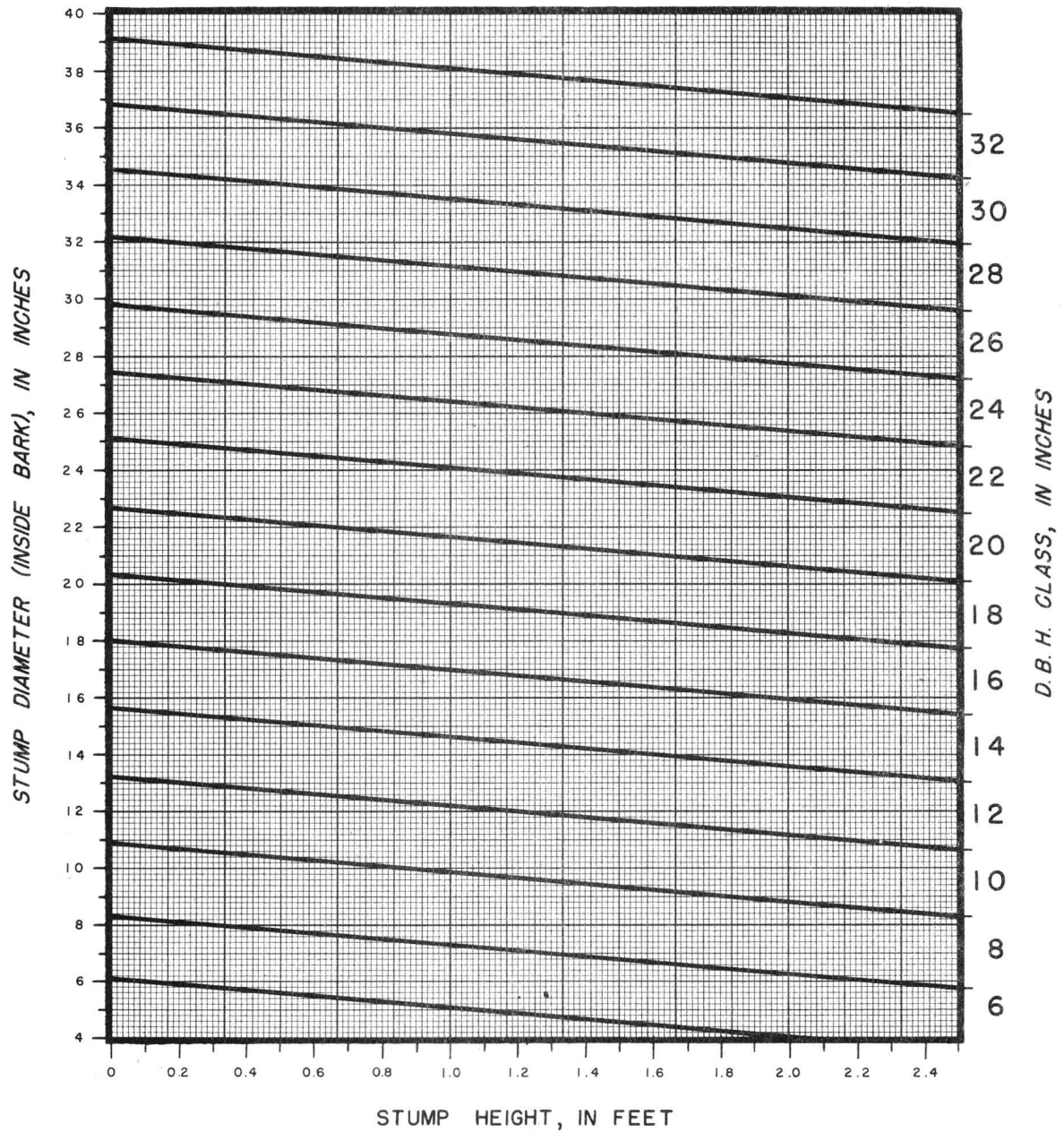
variance showed no significant differences in form class among states for 16 species and species groups.

For all practical purposes this graph is expected to give reliable d.b.h. estimates for white pine anywhere in the Northeast.

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--FREDERICK E. HAMPF

Forest Economist
Division of Forest Economics
Northeastern Forest Experiment Station

Agriculture-Forest Service-Upper Darby